

WLCI Products List as of August 14, 2013

This list is organized by major WLCI projects:

- Baseline Synthesis (includes Socioeconomics)
- Targeted Monitoring and Research (includes Long-term Monitoring, Effectiveness Monitoring, and Mechanistic Studies of Wildlife)
- Data and Information Management
- Integration and Coordination

Within those four categories, products are listed in alphabetical order by 1st Author's (or lead PI's) last name for products that do not have a formal citation, lead PI name(s) is tacked on to the end of the product). The list is to include ONLY DURABLE products; thus, it no longer includes ephemeral products such as oral or poster presentations for which there was no published proceedings or compilation of abstracts.

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Baseline Assessment Activities (includes Socioeconomics)

Databases and Sampling Designs/Protocols

- Range maps for Wyoming's Species of Greatest Conservation Need, Version 1.0 geodatabase created by and available from the Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming. Doug Keinath and Matt Kauffman
- Distribution models for Wyoming's Species of Greatest Conservation Need, geodatabase: Laramie, Wyo., Wyoming Natural Diversity Database, University of Wyoming. Doug Keinath and Matt Kauffman
- Database identifying important agricultural lands in the Wyoming Landscape Conservation Initiative area: Addressing productivity, cultural, and ecological importance (draft). William Gascoigne and R Nelson
- Corrections, revisions, and updates to more than 500 records for each of the mine sites have been entered in the active USGS MRDS database; countless duplicate records have been deleted after being consolidated. For easy retrieval, all current WLCI records have the group code "WLCI" at <http://mrds.cr.usgs.gov:7777/mrds/f?p=130>: or <http://tin.er.usgs.gov/mrds/>. Anna Wilson
- Downscaled monthly temperature and precipitation data for 1901–2002 at a 30-arc-second resolution for an area encompassing the WLCI study area (the basis for the downscaled future climate data listed below); revised in 2012. Sarah Shafer
- Downscaled simulated future temperature and precipitation data from three coupled atmosphere-ocean general circulation models [CCSM3, CGCM3.1(T47), and UKMO-HadCM3] to a 30-arc-second grid of the WLCI study area for the period 2001-2100; plus documentation describing the downscaled data (under development). Sarah Shafer
- Comprehensive relational database of ground-water information organized by type of aquifer Kirk (http://waterplan.state.wy.us/plan/green/2010/finalrept/gw_toc.html). Kirk Miller and Mike Sweat
- U.S. Geological Survey, variously dated, USGS Water Data for the Nation: National Water Information System--Web Interface, at <http://waterdata.usgs.gov/nwis>. Mike Sweat
- U.S. Geological Survey, variously dated, Techniques of Water-Resources Investigations Reports: Methods for the collection, analysis, and archiving of hydrologic data, at <http://pubs.usgs.gov/twri/>. Mike Sweat
- GIS data associated with the IA and proposed and completed habitat projects. Datasets relevant to WLCI, which may be viewed by authorized users at <https://my.usgs.gov/csc/wlci>. Zack Bowen
- U.S. Geological Survey, variously dated, Techniques and Methods Report: Methods for the collection, analysis, and archiving of hydrogeologic data, at <http://pubs.usgs.gov/tm/>. Kirk Miller and Mike Sweat
- U.S. Geological Survey, 1997–2013, National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chaps. A1–A9, 2 v., variously paged, available on Web at <http://pubs.water.usgs.gov/twri9A>. Chapters

originally were published from 1997–1999; updates and revisions are ongoing and are summarized at <http://water.usgs.gov/owq/FieldManual/mastererrata.html>. Kirk Miller and Mike Sweat

- U.S. Geological Survey, variously dated, Water-resources data for the United States, Water Year 2008: U.S. Geological Survey Water-Data Report WDR-US-2008, at <http://wdr.water.usgs.gov/>. Kirk Miller and Mike Sweat

Maps and Imagery

- Assisted the Wyoming Department of Agriculture with preparing priority areas associated with the agriculture community. Pat Anderson
- Thematic maps that identify areas of interest and areas of concern by WLCI partners and collaborators. Pat Anderson and Tim Assal
- Spatiotemporal land use map (Energy Development and Rural Residential Growth) of Sublette County. Tim Assal
- GIS geospatial maps associated with the IA and proposed and completed habitat projects. Datasets relevant to WLCI, which may be viewed by authorized users at <https://my.usgs.gov/csc/wlci>. Zack Bowen
- Total Land Disturbance Maps for two 2007 SPOT scenes covering energy-development fields in the Green River Basin. Steve Garman
- Geospatial data layer of oil/gas pads. Steve Garman
- Ten Landsat 5 scenes were “mosaicked” to develop a mineral composite map that covers the entire WLCI study area, including the 2009 expansion into Carbon County; scenes used to produce a mineral composite map showing clays, carbonates, sulfates, and micas as red; ferric iron minerals as green; and ferrous iron minerals, bare rock, and soil as blue. Robert McDougal
- Map of mercury concentrations at sites sampled in Southwest Wyoming. Jane Holloway and Robert McDougal
- Depth maps for Frontier Formation and Mesaverde Group, at <http://energy.cr.usgs.gov/oilgas/noga/> and http://energy.cr.usgs.gov/regional_studies/wlci/. Chris Potter
- Uranium resources map (in review). Anna Wilson and Laura Biewick.

USGS Series Reports (published, in press, or BAO approved)

- Assal, T.J., Garman, S.L., Bowen, Z.H., Anderson, P.J., Manier, D., and McDougal, R.R., 2012, Data resources for the Wyoming Landscape Conservation Initiative integrated assessment: U.S. Geological Survey Data Series 700, at http://www.fort.usgs.gov/Products/Publications/pub_abstract.asp?PubID=23486. Zack Bowen (see also Support and Decision Tools under Integration and Coordination Activities)
- Bartos, T.T., Hallberg, L.L., Mason, J.P., Norris, J.R., and Miller, K.A., 2006, Water Resources of Carbon County, Wyoming: U.S. Geological Survey Scientific Investigations Report 2006-5027, 191 p. Kirk Miller and Mike Sweat

- Biewick, L.R.H., 2009, Oil and Gas Development in southwestern Wyoming—Energy data and services for the Wyoming Landscape Conservation Initiative (WLCI): U.S. Geological Survey Data Series DS 437, at <http://pubs.usgs.gov/ds/437/>. Laura Biewick
- Biewick, L.R.H., 2011, Geodatabase of Wyoming statewide oil and gas drilling activity to 2010: U.S. Geological Survey Data Series 625, at <http://pubs.usgs.gov/ds/625/>. Laura Biewick
- Biewick, L.R.H., and Jones, N.R., 2012, Energy map of southwestern Wyoming, Part A—Coal and wind: U.S. Geological Survey Data Series 683, 18 p. pamphlet, 5 pls., at <http://pubs.usgs.gov/ds/683/>. Laura Biewick
- Biewick, L.R.H., Jones, N.R., and Wilson, A.B., 2013, Energy map of southwestern Wyoming: Energy data archived, organized, integrated and accessible: U.S. Geological Survey General Information Product 145, 21 slides, at <http://pubs.usgs.gov/gip/145/>. Laura Biewick
- Biewick, L.R.H., and Wilson, A.B., 2013, Energy map of southwestern Wyoming, Part B—Oil, gas, oil shale, uranium and solar: U.S. Geological Survey Data Series (in review). Laura Biewick and Anna Wilson
- Blecker, S.W., Stillings, L.L., Amacher, M.C., Ippolito, J.A., and DeCrappeo, N., 2010, Ecosystem health in mineralized terrane—Data from Podiform Chromite (Chinese Camp mining district, California), Quartz Alunite (Castle Peak and Masonic mining districts, Nevada/California), and Mo/Cu porphyry (Battle Mountain mining district, Nevada) deposits: U.S. Geological Survey Open-File Report, 2010–1040, 38 p. Robert McDougal
- Foster, Katharine, 2012, Bankfull-channel geometry and discharge curves for the Rocky Mountains Hydrologic Region in Wyoming: U.S. Geological Survey Scientific Investigations Report 2012–5178, 20 p., at <http://pubs.usgs.gov/sir/2012/5178/sir2012-5178.pdf>. Mike Sweat
- Garman, S., and others, 2010, WLCI Conceptual Models & Indicator Selection for Long-term Monitoring, U.S. Geological Survey Scientific Investigations Report 2010 (in review). Steve Garman
- Kirschbaum, M.A., and Mercier, T.J., 2013, Controls on the deposition and preservation of the Cretaceous Mowry Shale and Frontier Formation and equivalents, Rocky Mountain Region, Colorado, Utah, and Wyoming: American Association of Petroleum Geologists Bulletin, v. 97, p. 877–898, at <http://aapgbull.geoscienceworld.org/content/97/6/899.full>. Laura Biewick
- Lyon, K., and Montag, J.M., Ranching community perceptions toward energy development in Southwest Wyoming: U.S. Geological Survey, Open-File Report (in revision). Jessica Montag
- Mason, J.P., and Miller, K.A., 2005, Water resources of Sweetwater County, Wyoming: U.S. Geological Survey Scientific Investigations Report 2004-5214, 188 p., 2 pl., at <http://pubs.water.usgs.gov/sir2004-5214>. Kirk Miller
- Miller, H., J.M. Montag, and M. Essen, and P. Ponds, 2010, Socioeconomic effects of oil and gas development in the western United States: A literature review and case study. U.S. Geological Survey Open-File Report 2011 (in review). Jessica Montag
- Montag, J.M., Willis, C.J., and Glavin, L.W., 2011, Abbreviated bibliography on energy development—A focus on the Rocky Mountain Region: U.S. Geological Survey Open-File Report 2011–1206. 316 p. Jessica Montag

- Montag, J.M, Willis, C., Glavin, L., Eberhardt-Frank, M.K., Everette, A.L., Peterson, K., Nicoud, S., and Novacek, A., 2013, Western energy citation clearinghouse (v. 1): Fort Collins, U.S. Geological Survey, at <http://my.usgs.gov/wecc/>. Jessica Montag
- Tuttle, M.L., 2009, A collection of chemical, mineralogical, and stable isotopic compositional data for Green River oil shale from depositional center cores in Colorado, Utah, and Wyoming: U.S. Geological Survey Open-File Report 2009-1274, 18p. Michele Tuttle and Robert McDougal
- Tuttle, M.L., 2009, A collection of chemical, mineralogical, and stable isotopic compositional data for Green River oil shale from depositional center cores in Colorado, Utah, and Wyoming: U.S. Geological Survey Open-File Report 2009–1274, 18p. Michele Tuttle and Robert McDougal
- Wilson, A.B., 2014, Mineral resources of WLCI Fact Sheet (draft). Anna Wilson
- Wilson, A.B., 2013, Uranium in the WLCI study area, SW Wyoming: U.S. Geological Survey Open-File Report (in review). Anna Wilson
- Wilson, A.B., Aggregate (sand and gravel) assessment of WLCI (draft). Anna Wilson

Journal Articles and Other Non-USGS Publications (published, in press, or accepted)

- Assal, T.J., and Montag, J.M., 2012, A tale of two land uses in the American West: Rural residential growth and energy development: *Journal of Maps*, v. 8, no. 4, p. 327—333.
- Bern, C., Clark, M., Schmidt, T., Holloway, J., and McDougal, R., 2013, Salinity increase in a semi-arid watershed undergoing energy development: Patterns and potential drivers: *Hydrological Sciences Journal* (in review).
- Blecker, S.W., Stillings, L.L., Amacher, M.C., Ippolito, J.A., and DeCrappeo, N., Development of an SQI from data for soil organic matter and microbiological activity, in mineralized terranes (manuscript to be submitted to a peer-reviewed journal). Robert McDougal
- Clarey, K.E., Bartos, T., Copeland, D., Hallberg, L.L., Clark, M.L., and Thompson, M.L., 2010, Green River Basin 2010 Groundwater Report: Available groundwater determination: Wyoming Water Development Office Technical Memorandum, at http://waterplan.state.wy.us/plan/green/2010/finalrept/gw_toc.html . Mike Sweat
- Foster, K., 2012, Development of regional curves relating bankfull-channel geometry and discharge to drainage area for the Rocky Mountain Hydrologic Region in Wyoming: A report to the Sublette County Conservation District, Wyoming. (Draft) Katharine Foster
- Garman, S.L., and Diffendorfer, J., Instructional White Paper. Overview of Procedures for Selecting & Prioritizing Indicators for Monitoring: The Wyoming Landscape Conservation Initiative. USGS in-house report – Rocky Mountain Geographic Science Center, Denver, CO. Steve Garman
- Holloway, J.M., Bern, C., Schmidt, T.S., McDougal, R. R., Clark, M. L. Stricker, C. A., Wolf, R. E., 2011, Evaluating natural gas development impacts on stream ecosystems in an Upper Colorado River watershed, *Eos Transactions, American Geophysical Union* 92, Fall Meeting Supplement, Abstract H31A-1124. Robert McDougal
- Keinath, D. A., 2010, Summary of AWWED distribution models: Laramie, Wyo., Wyoming Natural Diversity Database, delivered to Wyoming Game and Fish Department, Cheyenne, Wyo. Doug Keinath and Matt Kauffman

- Keinath, D.A., Andersen, M.D., and Beauvais, G.P., 2010, Range and modeled distribution of Wyoming's species of greatest conservation need: Laramie, Wyoming, Wyoming Natural Diversity Database, University of Wyoming, report prepared for the Wyoming Game and Fish Department and the U.S. Geological Survey, at <http://uwadmnweb.uwyo.edu/wyndd/info.asp?p=3455>.
- Main Report and Appendix 1:
<http://www.uwyo.edu/wynddsupport/docs/Reports/WYNDDReports/U10KEI01WYUS.pdf>
- Appendix 2, Environmental Data:
http://www.uwyo.edu/wynddsupport/docs/Reports/WYNDDReports/U10KEI01WYUS_Appendix2.pdf
- Appendix 3, Species Summary and Index:
http://www.uwyo.edu/wynddsupport/docs/Reports/WYNDDReports/U10KEI01WYUS_Appendix3.pdf
- Appendix 4, Amphibian Reports:
http://www.uwyo.edu/wynddsupport/docs/Reports/WYNDDReports/U10KEI01WYUS_Appendix4.pdf
- Appendix 5, Bird Reports:
http://www.uwyo.edu/wynddsupport/docs/Reports/WYNDDReports/U10KEI01WYUS_Appendix5.pdf
- Appendix 6, Mammal Reports:
http://www.uwyo.edu/wynddsupport/docs/Reports/WYNDDReports/U10KEI01WYUS_Appendix6.pdf
- Appendix 7, Reptile Reports:
http://www.uwyo.edu/wynddsupport/docs/Reports/WYNDDReports/U10KEI01WYUS_Appendix7.pdf
- Keinath, D.A., M. Andersen and G. Beauvais, 2010, Range maps for Wyoming Species of Greatest Conservation Need: Laramie, Wyo., Wyoming Natural Diversity Database, University of Wyoming, prepared for the Wyoming Game and Fish Department. Doug Keinath and Matt Kauffman
- Keinath, D., Kauffman, M., Doak, D., Copeland, H., Andersen, M., and Pocerwicz, A., 2013, Quantifying exposure of wildlife to energy development in the face of rapidly expanding U.S. production: Ecological Applications (in review). Doug Keinath and Matt Kauffman

Models, Analyses

- First version of the Integrated Assessment analysis and product development completed. Zack Bowen
- Prototype of the spatially explicit, frame-based land use/land cover simulation model. Steve Garman
- Energy build-out scenarios for Wyoming. Created by and available from the Wyoming Natural Diversity Database, University of Wyoming, Laramie, in cooperation with the Wyoming office of The Nature Conservancy, Lander. (Under Development; anticipated completion September-October 2010) Doug Keinath and Matt Kauffman
- Potential exposure of Wyoming's species of greatest conservation need to energy development activities. Created by and available from the Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming in cooperation with the Wyoming Cooperative Fish and Wildlife

Research Unit and the Wyoming office of The Nature Conservancy. (Under Development; anticipated completion January-March 2011) Doug Keinath and Matt Kauffman

- Preliminary bankfull regional curves for 40 sites located throughout Wyoming (6 of which are in the WLCI area). Mike Sweat
- Aggregate (sand and gravel) assessment of WLCI (draft). Anna Wilson

Decision Support Tools, Web Sites, Web Applications, Servers/Platforms

- Web-based tool for expert review of Wyoming's SGCN range maps and the Northwest Regional Gap Analysis Project. Created by WYNDD and the Wyoming Geographic Information Science Center. Doug Keinath and Matt Kauffman
- USGS Energy Program WLCI Map/Web Services, including GIS Data/Interactive Maps at http://energy.cr.usgs.gov/regional_studies/wlci/. Chris Potter and Laura Biewick
- Integrated Assessment (IA) Web application and dynamic mapping platform (<http://www.wlci.gov/integrated-assessment>) used to display the IA, and to access underlying resource scores. Zack Bowen

Targeted Monitoring and Research Activities (includes Long-term Monitoring, Effectiveness Monitoring , and Mechanistic Studies of Wildlife)

Databases and Sampling Designs/Protocols

- Data from re-sampling permanent monitoring plots at 260 locations distributed across four QuickBird scenes in the WLCI area. Cam Aldridge
- Database of vegetation sampled at 147 sites across 2 of the 17 WLCI long-term monitoring QuickBird scenes (sampled in 2008, 2009). Cam Aldridge and Collin Homer
- Database of permanent monitoring plots at 238 sites across 4 QuickBird scenes (sites sampled in 2006, 2008, and 2009); the distribution of sites is structured by landscape-scale patterns of variability as detected in remote-sensing imagery. Cam Aldridge and Collin Homer
- Database of vegetation sampled at 385 sites across 6 long-term monitoring QuickBird scene footprints. Cam Aldridge and Collin Homer
- Database of vegetation sampled at 66 sites across 6 smaller (2 x 2 km) QuickBird Scene footprints, representing permanent monitoring plots. Cam Aldridge and Collin Homer
- Data from permanent monitoring plots in the QuickBird scene (site 1), sampled on a seasonal basis (early summer, summer, fall). Cam Aldridge and Collin Homer
- 2011 and 2012 vegetation dataset with plot photos for the Aspen Regeneration Associated with Mechanical Removal of Subalpine Fir study. Pat Anderson
- 2011 dataset with tree height and dbh measurements, and plot photos for the Herbivory, Stand Condition, and Regeneration Rates of Aspen on Burned and Unburned Plots in the Little Mountain Ecosystem. Pat Anderson

- Datasets with establishment dates and age chronologies for 908 aspen and conifer samples for the Herbivory, Stand Condition, and Regeneration Rates of Aspen on Burned and Unburned Plots in the Little Mountain Ecosystem. Pat Anderson
- 2011 vegetation dataset with plot photos for the greater sage-grouse use of vegetation treatments in the Moxa Arch study area. Pat Anderson
- Pellet transect data collected from 2009-2012 for the greater sage-grouse use of vegetation treatments in the Moxa Arch study area. Pat Anderson
- Soil texture data for the greater sage-grouse use of vegetation treatments in the Moxa Arch study area. Pat Anderson
- List of invasive species recorded along transects in burned areas within the Little Mountain Ecosystem area. Pat Anderson
- Geospatial data of spotted knapweed locations in aspen study area and list of invasive species in study plots. Pat Anderson
- Geospatial data of monitoring plots and photo points for herbivory, stand condition, and regeneration rates of aspen on burned and unburned plots. Pat Anderson
- Strategies, approaches, and designs, as well as common sampling protocols, for conducting effectiveness monitoring on conservation projects and enhancements conducted as part of the WLCI at multiple spatial and temporal scales. Geneva Chong
- Datasets assembled from satellite imagery archive and long-term climate data for Semi-Arid Woodlands project. Tim Assal
- Methodology and covariates completed for Application and Feasibility of Mapping Aspen Stands and Conifer Encroachment Using Classification and Regression Tree (CART) Analysis for Effectiveness Monitoring study. Tim Assal and Pat Anderson
- 2011 and 2012 groundwater-quality data, at <http://nwis.waterdata.usgs.gov/wy/nwis/qw>. Greg Boughton
- Preliminary set of Inventory and Monitoring designs based on monitoring objectives, analyses of pilot data (including summary statistics, power analyses, and modeling and simulation exercises), implementation scenarios and potential funding levels. Tasha Carr and Dan Manier
- Songbird community dataset; consists of avian abundance, diversity, nest site selection, nest success, nest predator species, nest predator abundance, nest predator diversity, nestling quality, habitat, distance from and extent of disturbance information. Anna Chalfoun
- Dataset of bird species observed using aspen stands in the Greater Little Mountain Areas including abundance and migratory status. Tasha Carr
- Landscape-scale study design for evaluating effects of stand structure and landscape structure (size and isolation of aspen patches) for the 2010 field season. Tasha Carr
- Water-quality data from Muddy Creek Synoptic study were made publicly available on the National Water Information System Web Interface (NWISWeb) at <http://nwis.waterdata.usgs.gov/wy/nwis/qwdata>. Melanie Clark
- MSAccess database of plant species composition and structure in 50 multi-scale vegetation plots to evaluate vegetation treatments implemented at different times across the WLCI area; sampling and analyses ongoing with some slated for completion in 2012. Geneva Chong

- MSAccess and MSEXcel datasets for plant phenology reflectance data from 14 mantis platforms: one reading every 10 mins over a 3-month deployment. Geneva Chong
- MSAccess monitoring database of multiscale vegetation/habitat condition plot data (n = 125 over 2008 and 2009), including native and non-native plant species cover and height, spatial location, and digital photos for each plot (included areas treated with herbicide, prescribed burning, and those planned for herbicide habitat treatments); sampling and analyses ongoing with some slated for completion in 2012. Geneva Chong
- Established and sampled 6 phenology plots to evaluate vegetation species composition, structure, and phenology related to a prescribed burn, cheatgrass and the Fall Creek Elk Feedground (ongoing – near-surface sensors deployed April 2010 with BLM’s Pinedale Field Office); sampling and analyses ongoing with some slated for completion in 2012. Geneva Chong
- Established 21 near-surface reflectance monitoring platforms (mantis) on the Jonah Field and near the Fall Creek Elk Feedground, which collected surface reflectance, incoming radiation, soil moisture (5 cm depth) and air temperature every 10 minutes during the 2010 growing season. Platforms are being re-deployed for the 2011 growing season near the Fall Creek Feedground. Developed an MSAccess database for management and analyses of reflectance data from the mantis platforms. Geneva Chong
- Mapping Mountain Shrub Communities project 2011 datasets of vegetation plots (species composition and cover) and GPS locations. Geneva Chong
- Lek-specific monthly climate data for sage-grouse in Wyoming, at 1-km resolution. Brad Fedy
- Dataset on long-term trends in well density and distribution surrounding greater sage-grouse lek sites in Wyoming. Brad Fedy
- Monitoring information database used by WLCI partners to identify and share monitoring information. Steve Garman
- Small mammal community baseline data from 24 sites – information to inform long term monitoring design. Steve Germaine
- Pygmy Rabbit site occupancy survey protocol for the WLCI project area. Steve Germaine
- LiDAR-derived sagebrush vegetative structure data for a 500 mi² area in the WLCI project area. Steve Germaine and Wes Newton.
- Crosstabulation matrix of area (ha) in each of seven wind energy development classes X pygmy rabbit site occupancy potential (four classes), sorted by BLM Field Office in the WLCI project area, Wyoming. Steve Germaine and Josh Schwartz.
- Database of salt samples from Muddy Creek. Richard Grauch
- WLCI Interagency Monitoring Database, Working draft (version 0.3). Dan Manier
- Water-quality data for water year 2012, publically accessible at <http://waterdata.usgs.gov/nwis>:
 - 09258980 Muddy Creek below Young Draw in the southeastern WLCI region, computed total-dissolved solids concentrations
 - 09205000 New Fork River near Big Piney, Wyo., monthly water-quality sampling
 - 09217000 Green River near Green River, Wyo., monthly water-quality sampling, real-time continuous water-temperature and specific conductance monitoring, real-time continuous computed total dissolved solids concentration

- 09258050 Muddy Creek above Olson Draw near Dad, Wyo., monthly water-quality sampling
- 09258980 Muddy Creek below Young Draw near Baggs, Wyo., monthly water-quality sampling

Kirk Miller and Mike Sweat

- Real-time groundwater-level data for well 413850109150601 near Rock Springs, Wyo., publically accessible at http://waterdata.usgs.gov/wy/nwis/uv/?site_no=413850109150601. Kirk Miller and Mike Sweat
- Final data for water year 2010 (October 1 through September 30) were published in the USGS Annual Water-Data Report (U.S. Geological Survey, 2011b). Individual site data sheets are available online:
 - <http://wdr.water.usgs.gov/wy2010/pdfs/09217000.2010.pdf>
 - <http://wdr.water.usgs.gov/wy2010/pdfs/09258050.2010.pdf>
 - <http://wdr.water.usgs.gov/wy2010/pdfs/09258980.2010.pdf>
 - <http://wdr.water.usgs.gov/wy2010/pdfs/413850109150601.2010.pdf>
- Preliminary data for water year 2011 (October 1 through September 30) were provided in real-time on the Internet via USGS NWISWeb. All data for each site are available online:
 - http://waterdata.usgs.gov/wy/nwis/nwisman/?site_no=09217000
 - http://waterdata.usgs.gov/wy/nwis/nwisman/?site_no=09258050
 - http://waterdata.usgs.gov/wy/nwis/nwisman/?site_no=09205000
 - http://waterdata.usgs.gov/wy/nwis/nwisman/?site_no=09258980
 - http://waterdata.usgs.gov/wy/nwis/nwisman/?site_no=413850109150601
- Final data for water year 2012 (October 1 through September 30) were published in the USGS Annual Water-Data Report (U.S. Geological Survey, 2012). Individual site data sheets are available online:
 - <http://wdr.water.usgs.gov/wy2012/pdfs/09217000.2012.pdf>
 - <http://wdr.water.usgs.gov/wy2012/pdfs/09258050.2012.pdf>
 - <http://wdr.water.usgs.gov/wy2012/pdfs/09258980.2012.pdf>
 - <http://wdr.water.usgs.gov/wy2012/pdfs/413850109150601.2012.pdf>
- A database of preliminary NDVI accuracy results, stratified by land cover/land use, from the Development and Evaluation of Synthetic High-Resolution Satellite Imagery for Effectiveness Monitoring study, was provided to the BLM's Kemmerer Field Office. Ed Olexa and Geneva Chong
- Geochemical data set listing determinations for the following 47 parameters from 139 samples of soil collected from a depth of 0–5 cm within the WLCI original study area: Al, As, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, carbonate C, Cu, organic C, Fe, Ga, Hg, In, K, La, Li, Mg, Mn, Mo, Na, Nb, Ni, P, Pb, Rb, S, Sb, Sc, Se, Sn, Sr, Th, Ti, Tl, U, V, W, Y, Zn, total N, soil pH, electrical conductivity, and sodium adsorption ratio. David Smith
- Periphyton and bed sediment database, including the parameters: periphyton (algae), bed sediment, pebble count, discharge and water quality (pH, dissolved oxygen, specific conductance, water temperature). Data are specific to five sites within the PAPA and at USGS streamgage 09205000 New Fork River near Big Piney, Wyo. Mike Sweat

Maps and Imagery

- GIS maps of songbird study areas, point count and nest locations. Anna Chalfoun
- NDVI map of vegetation treatment derived from a 2007 SPOT scene delivered for field evaluation of vegetation-treatment effectiveness. Geneva Chong
- Digital photos from plots and mantis deployments in plant phenology study. Geneva Chong
- Draft maps from the 2012 field effort for the Mapping Mountain Shrub Communities project. Geneva Chong
- Greater sage-grouse seasonal habitat selection maps (digital and hardcopy) highlighting critical sage-grouse habitat within the WLCI (under development). Brad Fedy
- GIS map showing locations of 24 small mammal live trap grids – this was part of long term monitoring baseline data, collected in 2008. Attributed information includes species and community metrics. Steve Germaine
- GIS map depicting pygmy rabbit site occupancy and vacancy status at 189 random survey sites in southwest Wyoming. Steve Germaine
- GIS map of potential for overlap between wind energy development and pygmy rabbits in WLCI project area. Steve Germaine and Josh Schwartz. Vintage 2009.
- Two maps of high priority mule deer migration routes in Atlantic Rim region, delivered to agencies (BLM, WGFD) and NGOs (TNC). Hall Sawyer and Matt Kauffman
- Two maps of mule deer migration segments used as foraging/resting habitat and those used for movement in Atlantic Rim region, delivered to agencies (BLM, WGFD) and NGOs (TNC). Hall Sawyer and Matt Kauffman
- Forty-seven geochemical maps showing the abundance and spatial distribution within the original WLCI study area for all 47 soil parameters in the soil parameters database (Al, As, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, carbonate C, Cu, organic C, Fe, Ga, Hg, In, K, La, Li, Mg, Mn, Mo, Na, Nb, Ni, P, Pb, Rb, S, Sb, Sc, Se, Sn, Sr, Th, Ti, Tl, U, V, W, Y, Zn, total N, soil pH, electrical conductivity, and sodium adsorption ratio). David Smith
- Forty-seven geochemical maps showing the abundance and spatial distribution within the WLCI study area for all 47 soil parameters in the data table published in Smith and Ellefsen (2010). David Smith
- Maps showing sampling sites within the WLCI study area that exceed the Environmental Protection Agency's (EPA) ecological soil screening levels for (1) As, Co, Mn, Ni, Se, and Zn (plants); Ba, Mn, Se, and Zn (soil invertebrates); Cd, Cu, Pb, Se, V, and Zn (birds); Ba, Cd, Sb, Se, and Zn (mammals); and (2) human-health soil screening levels for As, Co, and Mn. David Smith
- Maps showing the probability of exceeding EPA's ecological soil screening levels at any point throughout the entire WLCI study area for (1) As, Mn, and Zn (plants); Ba, Mn, and Zn (soil invertebrates); Cd and Zn (birds); Ba, Cd, Sb, and Zn (mammals); and (2) human-health soil screening levels for As and Mn. David Smith

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- Chong, G.W., and Allen, L.A., What are plants doing and when? Using plant phenology to facilitate sustainable natural resources management: WLCI Fact Sheet 3, 2 p., at <http://pubs.usgs.gov/wlci/fs/3/>.
- Clark, M.L., and Davidson, S.L., 2009, Specific conductance and dissolved-solids characteristics for the Green River and Muddy Creek, Wyoming, water years 1999-2008: U.S. Geological Survey Scientific Investigations Report 2009-5168, at <http://pubs.usgs.gov/sir/2009/5168/>. Mike Sweat
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- Holloway, J.M., Bern, C., Schmidt, T.S., McDougal, R.R., Clark, M.L. Stricker, C.A., Wolf, R.E., 2011, Evaluating natural gas development impacts on stream ecosystems in an Upper Colorado River watershed: EOS, Transactions of the American Geophysical Union, v. 92, Fall Meeting Supplement, Abstract H31A-1124. Robert McDougal
- Homer, C.G., Aldridge, C.L., Meyer, D.K., Coan, M.J., and Bowen, Z.H., 2008, Multiscale sagebrush rangeland habitat modeling in southwest Wyoming: U.S. Geological Survey Open-File Report 2008-1027. Collin Homer and Cam Aldridge
- Homer, C.G., Meyer, D.K., Aldridge, C.L. and Schell, S.J., 2013, Comparison of field and remote sensing multi-scale continuous field component predictions in a sagebrush ecosystem: Monitoring across seasons and years: Applied Remote Sensing (in review).
- Smith, D.B., and Ellefsen, K.J., 2010, Soil geochemical data for the Wyoming Landscape Conservation Initiative study area: USGS Data Series report 510, 10 p., at <http://pubs.usgs.gov/ds/510/>. David Smith
- Smith, D.B., and Ellefsen, K.J., 2010, Soil geochemical data for the Wyoming Landscape Conservation Initiative Study Area: U.S. Geological Survey Data Series Report 510, 12 p., revised September 2011, at <http://pubs.usgs.gov/ds/510/downloads/DS-510.pdf>. David Smith
- Sweat, M.J., 2013, Groundwater well inventory and assessment in the area of the proposed Normally Pressured Lance natural gas development project, Green River Basin, Wyoming: U.S. Geological Survey Data Series 770, 27 p., at <http://pubs.er.usgs.gov/publication/ds770>. Mike Sweat
- USGS, Annual Water Data Report: water-quality data from water year 2007 for 09217000 Green River near Green River, Wyo., at <http://wdr.water.usgs.gov/wy2007/pdfs/09217000.2007.pdf>, pp. 4–8). Kirk Miller and Mike Sweat
- USGS, Annual Water Data Report of FY07 approved water-level data for 42385020925601, 19-105-10bbb01 Rock Springs, Wyoming, at <http://wdr.water.usgs.gov/wy2007/pdfs/413850109150601.2007.pdf>. Kirk Miller and Mike Sweat

Journal Articles and Other Non-USGS Publications (published, in press, or accepted)

- Allen, L.A., and Kauffman, M.J., WLCI researchers employ new approaches to help managers conserve deer migrations: U.S. Geological Survey, WLCI Fact Sheet 2, 4 p., at http://pubs.usgs.gov/wlci/fs/2/WLCI_fs_2.pdf.
- Bern, C.R., Clark, M.L., Schmidt, T.S., Holloway, J.M., and McDougal, R.R., 2013, Salinity increase in a semi-arid watershed undergoing energy development: Patterns and potential drivers, *Hydrological Sciences Journal* (in review). Carl Bern
- Chalfoun, A.D., 2011, Study investigates changes in bird predation associated with energy development: Wyoming State Wildlife Action Plan Newsletter, December 2001, p. 2-3, at http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/SWAP_NEWSLETTER_DEC110000789.pdf. Anna Chalfoun
- Chalfoun, A.D., and Gilbert, M.M., Indirect effects of oil and natural gas development on the reproductive success of sagebrush songbirds: *Condor* (in revision). Anna Chalfoun
- Chong, G.W. et al., 2011, Heralding change: How can plant phenology be used to facilitate sustainable natural resources management?, abstract in Ecological Society of America 96th Annual Meeting, organized oral session #6776, Austin, Texas, August 7–12, 2011.
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- Fedy, B.C. and Doherty, K.E., 2011, Population cycles are highly correlated over long time series and large spatial scales in two unrelated species: Greater sage-grouse and cottontail rabbits: *Oecologia*, v. 165, no. 4, p 915–924. Brad Fedy
- Fedy, B.C., Aldridge, C.L., Doherty, K.E., O'Donnell, M., Beck, J.L., Bedrosian, B., Holloran, M.J., Johnson, G.D., Kaczor, N.W., Kirol, C.P., Mandich, C.A., Marshall, D., McKee, G., Olson, C., Swanson, C.C., and Walker, B., 2012, Interseasonal movements of greater sage-grouse, migratory behavior, and an assessment of the core regions concept in Wyoming: *Journal of Wildlife Management*, v. 76, no. 5, p. 1062–1071. Brad Fedy
- Fedy, B.C., and Aldridge, C.L., in press, Long-term monitoring of sage-grouse populations: The importance of within-year repeated counts and the influence of scale: *Journal of Wildlife Management*, 75: 1022-1033. Brad Fedy
- Fedy, B.C., Doherty, K.E., and Aldridge, C.L., 2012, Importance of within year repeated lek counts and highly correlated population cycles, in 28th Western Agencies Sage and Columbian Sharp-tailed Grouse Workshop, June 19–22, 2012, Steamboat Springs, Colo., at [. Brad Fedy](#)
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- Fedy, B.C., Doherty, K.E., Aldridge, C.L., O'Donnell, M., Beck, J.L., Bedrosian, B., Gummer, D., Holloran, M.J., Johnson, G.D., Kaczor, N.W., Kirol, C.P., Mandich, C.A., Marshall, D., McKee, G., Olson, C., Swanson, C.C., and Walker, B.L., in review, Habitat prioritization across large

landscapes, multiple seasons, and novel areas: An example using greater sage-grouse in Wyoming: Wildlife Monographs. Brad Fedy

- Germaine, S., and Ignizio, D., 2012, Gas energy development and pygmy rabbits in Wyoming, *in* Proceedings of the 2012 Restoring the West Conference: Logan, Utah.
- Germaine, S., and Ignizio, D., Pygmy rabbit distributions along a gradient of gas field development intensity in Wyoming (draft; target journal not yet selected).
- Germaine, S., Ignizio, D., Keinath, D., and Copeland, H., Field-validation of two predictive pygmy rabbit occupancy models in Wyoming (draft): Journal of Fish and Wildlife Management.
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- Gilbert, M. M., and Chalfoun, A. D., 2011, Energy development affects populations of sagebrush songbirds in Wyoming: Journal of Wildlife Management, v. 75, no. 4, p. 816–824. Anna Chalfoun
- Gilbert, M.M., and Chalfoun, A.D., Increased nest predation and food limitation as potential mechanisms underlying sagebrush-obligate songbird declines within energy development fields: Condor (in revision). Anna Chalfoun
- Homer, C.G., Aldridge, C.L., Meyer, D.K., and Schell, S.J., 2012, Multi-scale remote sensing sagebrush characterization with regression trees over Wyoming, USA—Laying a foundation for monitoring: International Journal of Applied Earth Observation and GeoInformation, v. 14, p. 233–244. Collin Homer, Cam Aldridge
- Homer, C.G., Meyer, D.K., Aldridge, C.L., and Schell, S.J., 2013, Comparison of remote sensing multi-scale continuous field component predictions in a sagebrush ecosystem, monitoring across seasons and years: Journal of Applied Remote Sensing (in review).
- Manier, D.J., Aldridge, C.L., Anderson, P.J., Chong, G., Homer, C.G., O'Donnell, M., and Schell, S.J., 2011, Land use and habitat conditions across the southwestern Wyoming sagebrush steppe: Development impacts, management effectiveness, and the distribution of invasive plants: Natural Resources and Environmental Issues, v. 17, no. 1., article 4, at <http://digitalcommons.usu.edu/nrei/vol17/iss1/4>. Dan Manier
- Sawyer, H.S., 2010, Habitat use and migration ecology of mule deer in developing gas fields of western Wyoming: Laramie, Wyoming, Ph.D. dissertation, University of Wyoming Department of Zoology and Physiology. Hall Sawyer and Matt Kauffman
- Sawyer, H. and Kauffman, M. J. 2011. Stopover ecology of a migratory ungulate. Journal of Animal Ecology 80:1078–1087, at <http://www.ncbi.nlm.nih.gov/pubmed/21545586>. Hall Sawyer and Matt Kauffman
- Sawyer, H., M. J. Kauffman, R. M. Nielson, and J. S. Horne. 2009. Identifying and prioritizing ungulate migration routes for landscape-level conservation. Ecological Applications 19:2016–2025. Hall Sawyer and Matt Kauffman
- Sawyer, H.S., M.J. Kauffman, and R.M. Nielson. 2009. Influence of well pad activity on the winter habitat selection patterns of mule deer. Journal of Wildlife Management 73:1052–1061. Hall Sawyer and Matt Kauffman

- Sawyer, H., Kauffman, M.J., Middleton, A.D., Morrison, T.A., Nielson, R.M., and Wyckoff, T.B., 2013, A framework for understanding semi-permeable barrier effects on migratory ungulates: *Journal of Applied Ecology*, v. 50, p. 68—78. Matt Kauffman
- Schmidt, T.S., Wolf, R.E., Stricker, C.A., Holloway, J.M., Bern, C.R., Clark, M.L, and McDougal, R.R., 2012, Riparian consumers as indicators of aquatic contaminants: Society of Freshwater Science Annual Meeting, Louisville, Ky., May 20-24 2012, at <http://www.sgmeet.com/sfs/sfs2012/viewabstract2.asp?AbstractID=6837>. Robert McDougal
- Xian, G., Homer, C.G., and Aldridge, C.L., 2011, Assessing long-term variations in sagebrush habitat—Characterization of spatial extents and distribution patterns using multi-temporal satellite remote sensing data: *International Journal of Remote Sensing*, v. 33, no. 7, p. 2034–2058. Collin Homer, Cam Aldridge
- Xian, G., Homer, C.G., and Aldridge, C.L., 2012, Effects of land cover and regional climate variations on long-term spatiotemporal changes in sagebrush ecosystems: *GIScience & Remote Sensing*, v. 49, 378—396. Collin Homer, Cam Aldridge

Models, Analyses

- 20 draft QuickBird-based models (2.4-m res.) to support modeling for the WLCI area (13 w/in WLCI boundary), including estimates of percent canopy cover of sagebrush, big sagebrush, Wyoming sagebrush, all shrubs combined, herbaceous species, litter, and bare ground; and shrub height. Cam Aldridge and Collin Homer
- 8 Landsat-based models (30-m resolution) for WLCI area and Wyoming, including estimates of percent canopy cover of sagebrush, big sagebrush, Wyoming sagebrush, all shrubs combined, herbaceous species, litter, and bare ground; and shrub height; based on 2006 and 2007 data. Cam Aldridge and Collin Homer
- 8 AWiFS-based component models (30-m resolution) for the WLCI area and Wyoming, including estimates of percent canopy cover of shrubs, sagebrush, big sagebrush, Wyoming sagebrush, herbs, litter, and bare ground; and shrub height. Cam Aldridge and Collin Homer
- Preliminary analyses on associations of vegetation cover (and variability in cover) with environmental variables (ecosystem drivers) across the region, based on field-based sampling. Cam Aldridge and Collin Homer
- Analysis of change in sagebrush, herbaceous, plant, and bare ground cover between 1988 and 2006 for Landsat scene 37/31 (west half of WLCI) to calculate amount of change in 18 years. Cam Aldridge and Collin Homer
- Preliminary analyses of data for 711 sage-grouse nest sites in SW Wyoming, to develop the initial ‘proof-of-concept’ application for sagebrush habitat maps. Cam Aldridge and Collin Homer
- Greater sage-grouse population models and population trend analyses using generalized additive models. Cam Aldridge and Collin Homer
- Sagebrush-obligate songbird density in relation to oil and natural gas well densities for the Labarge oil field and Pinedale Anticline and Jonah natural gas fields. Anna Chalfoun
- Preliminary analysis of the influence of nest predator abundance, microhabitat characteristics, well density, natural gas field, and year on sagebrush-obligate nest survival. Anna Chalfoun

- Models examining the relationship between well density as an index of development intensity and GIS-derived landscape ecology metrics (sagebrush loss, average patch size, edge extent, patch isolation) at songbird study sites. Anna Chalfoun
- Greater sage-grouse seasonal habitat selection models highlighting critical sage-grouse habitat within the WLCI. Geneva Chong
- Scaling plant phenology data from 1-m to the landscape (under development); phenology data collected summer 2010, analyses to be completed in 2012. Geneva Chong
- Plant phenology and elk movement data from the Fall Creek Feedground area (collaboration with Paul Cross, USGS NOROCK and Bob Klaver, USGS EROS with initial funding from the first USGS National Climate Change Wildlife Science Center RFP) (under development); GPS collars (Cross) recovered summer 2010, analyses to be completed in 2012. Geneva Chong
- Summarized effectiveness monitoring data from 2008 (Pinedale Anticline treatments and Rock Creek Allotment/Fossil Butte National Monument Prescribed Burn: Prepared by David Kesonie, contracted to USGS; unpubl. data). Geneva Chong
- Analysis addressing the influence of climate and weather on long-term fluctuations in sage-grouse populations. Brad Fedy
- Analysis of population cycles for sage-grouse and cottontail rabbit. Brad Fedy
- Predictive range map for pygmy rabbits in Wyoming, incorporating both natural and anthropogenic predictors. Steve Germaine
- Trend analysis to detect change in sagebrush components across five years of permanent plot sampling; trend analysis incorporated field plot data, QuickBird imagery, and Landsat imagery. Dan Manier, Cam Aldridge, Collin Homer
- Exploratory data analysis plots, including histograms, Tukey boxplots, empirical cumulative distribution function plots, and quantile-quantile plots for the following parameters from 0–5-cm soils collected within the original WLCI study area: Al, As, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, carbonate C, Cu, organic C, Fe, Ga, Hg, In, K, La, Li, Mg, Mn, Mo, Na, Nb, Ni, P, Pb, Rb, S, Sb, Sc, Se, Sn, Sr, Th, Ti, Tl, U, V, W, Y, and Zn. David Smith
- Box-and-whisker plots comparing geochemical data on 0–5-cm soils from the original WLCI study area to similar data from two transects across the United States and Canada for the parameters As, Ca, Cd, Cu, Hg, Pb, Sb, and Tl. David Smith
- Expanded eight spatial models for sagebrush components based on two QuickBird scenes for the five primary sagebrush components based on Landsat path 37/row 31 (southwestern Wyoming) for every other year, beginning with 2008 back to 1985, for use in trend analyses. Dan Manier, Cam Aldridge, Collin Homer
- Landsat change vector analysis for the entire WLCI region to evaluate the amount of change for seven sagebrush components between 2006 and 2010. Dan Manier, Cam Aldridge, Collin Homer
- Species distribution models for the ten most abundant invasive plant species occurring in a sample of 123 transects distributed across the WLCI area; maps and analytical results will be prepared for publication in 2012. Dan Manier, Cam Aldridge, Collin Homer
- Exploratory data analysis plots, including histograms, Tukey boxplots, empirical cumulative distribution function plots, and quantile-quantile plots for the following elements from 0–5-cm soils from the WLCI study area: Al, As, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, carbonate C, organic C, Cu,

Fe, Ga, Hg, In, K, La, Li, Mg, Mn, Mo, Na, Nb, Ni, P, Pb, Rb, S, Sb, Sc, Se, Sn, Sr, Th, Ti, Tl, U, V, W, Y and Zn. David Smith

- Initial analyses quantifying the effects of landscape structure at multiple scales on the densities of migrating and resident bird species in aspen and riparian forests in the Green River Basin. Tasha Carr

Decision Support Tools, Web Sites, Web Applications, Servers/Platforms

- 21 “mantis” near-surface sensing platforms deployed for plant phenology reflectance data to detect green-up and senescence at the 1-m scale to correlate with remotely sensed data to allow scaling from the plot to the landscape with minimal ground-truth sampling (plots); platforms built in FY09, deployed in FY10 and FY11, data analysis software under development, expected completion of analyses in 2012. Geneva Chong
- Software to process the plant phenology datasets for QA/QC and preparation for data analyses (beta version). Geneva Chong
- Smith, D.B., 2012, Potentially toxic elements in soils of the Wyoming Landscape Conservation Initiative Study area: Implications for ecological and human health (text, tables, and figures submitted for potential incorporation into the WLCI Integrated Assessment). Dave Smith

Data and Information Management Activities

Databases and Sampling Designs/Protocols

- USGS ScienceBase Catalog, at <http://www.wlci.gov/catalog/WLCI/item/search>; includes 576 datasets—primarily geospatial—provided by WLCI partners and harvested from data providers. The data catalog has made it possible to easily identify data gaps and suggest ways to address them, and develop guidelines for data integration and support. Later refined and structured metadata for display in WLCI website via Web services. Natalie Latysh and Sky Bristol
- PostgreSQL database, at <https://www.wlci.gov>; this is an object-relational geodatabase system, and an ArcGIS 9.3 map server that enable users to identify and display WLCI data resources, along with geospatial locations and descriptive information about each database (metadata). Natalie Latysh and Sky Bristol
- GIS-based database of WLCI funded and proposed habitat treatments and WLCI partners priority focus areas. Natalie Latysh and Sky Bristol
- WLCI project geodatabase containing location and descriptive (attribute) information. Natalie Latysh and Sky Bristol
- Fully attributed dataset for pygmy rabbit occupancy at 189 survey points throughout western Wyoming (contains coordinates, type of evidence present, occupancy status). Steve Germaine
- Standardized protocol template for geospatial information developed and shared with WLCI partners. Natalie Latysh and Sky Bristol
- Added over 400 data records relevant to the WLCI to the Data Clearinghouse in 2009. Natalie Latysh and Sky Bristol

- Refined and updated information products in the ScienceBase catalog: updated data records harvested from the WYGISC, which include current data sets produced by the WGFD. Natalie Latysh and Sky Bristol
- Cataloged animal and plant species occurrence data produced by the WYNDD for the Wyoming BLM in the WLCI Data Clearinghouse. Natalie Latysh and Sky Bristol
- Updated and current project information entered into the WLCI Data Clearinghouse. Natalie Latysh and Sky Bristol
- Generated an Access database to document monitoring activities conducted by WLCI partners. The monitoring database is stored in the myUSGS Confluence space. Natalie Latysh and Sky Bristol
- Advanced the Web-servicing capabilities that allow use of cataloged information items, such as project information and citations, in WLCI Website. Natalie Latysh and Sky Bristol
- For the WLCI Website, Web service capabilities were developed to dynamically display science project information and publication citations cataloged in WLCI Data Clearinghouse. Natalie Latysh and Sky Bristol
- The WLCI bibliography was improved, and additional publication citations relevant to WLCI were documented and cataloged in WLCI Data Clearinghouse. Natalie Latysh and Sky Bristol
- Protocols for assembling data originating from monitoring and scientific fact-finding efforts for the WLCI Data Clearinghouse. Natalie Latysh

Maps and Imagery

- Maps of proposed and funded WLCI conservation project locations to support the WLCI Web site. Natalie Latysh and Sky Bristol

USGS Series Reports (published, in press, or BAO approved)

- Latysh, N., and Bristol, S., 2011, Wyoming Landscape Conservation Initiative Data Management and Integration: U.S. Geological Survey, WLCI Fact Sheet 1, at http://pubs.usgs.gov/wlci/fs/1/WLCI_FS_1.pdf.

Decision Support Tools, Web Sites, Web Applications, Servers/Platforms

- WLCI Web site (www.wlci.gov): a centralized venue for publically sharing information about the WLCI. Representatives from several agencies, serving on the WLCI Coordination Team, manage web site content; includes documents, maps, newsletters, meeting schedules, bibliography including agency reports and USGS publications, meeting agendas and notes, access to the Data Catalog and Projects Database; provides a searchable context view of WLCI data available to internal and external audiences (non-public data access requires authentication and authorization through the WLCI online community); this tool is used to support development and design of WLCI conservation actions by local project development teams and the WLCI Coordination Team. After initial development maintained and enhanced the Web services each year to efficiently serve data and information from WLCI Data Clearinghouse to WLCI website. Natalie Latysh and Sky Bristol
- Enhancements for posting content to the WLCI Web site directly. Natalie Latysh and Sky Bristol
- Online data management framework, available at: my.usgs.gov, composed of:

- a) Wiki – collaborative space for informally posting, sharing, and preserving information;
- b) Document manager – space for file organization, storage, and sharing; and
- c) Data Catalog – centralized locale for assembling, cataloging, providing datasets associated with WLCI; data are generated by USGS, partner agencies, and external data providers.

Natalie Latysh and Sky Bristol

- WLCI spatially-explicit project tracking tool (www.wlci.gov): Science and Conservation Projects Database—an online system displaying mapped habitat and science project locations and associated information, including project descriptions, management details, duration, activity updates, publication products, and photographs. Representatives from several agencies, including BLM, USFWS, USGS, are able to add and edit project information. In 2012, advanced Web servicing capabilities allowing use of cataloged information items, such as project information and citations, and enhanced WLCI habitat and science project metadata for transfer to and dynamic display in WLCI website. Natalie Latysh and Sky Bristol
- THREDDS server platform for storage and serving of model outputs and data in NetCDF format and a data hosting/serving context for Sustainable Energy Development (under development). Natalie Latysh and Sky Bristol
- Web-based form for WLCI partners to use when submitting new project data for review and possible inclusion in the WLCI project database. Natalie Latysh and Sky Bristol
- Additions to the “SCIM” application to facilitate the housing and maintenance of content specific to the WLCI Web site. Natalie Latysh and Sky Bristol
- Training materials for appropriate staff in using the SCIM tool to maintain Web site content. Natalie Latysh and Sky Bristol
- Jonah Infill Data Management System—decision support system that *tracks* real-time information associated with surface disturbance, reclamation, and mitigation efforts in the Jonah Natural Gas Field and supports regulatory decisions by the Jonah Interagency Mitigation and Reclamation Office. Tim Kern
- Development of cataloging methods for monitoring protocols for potential use by WLCI Monitoring Team. Natalie Latysh
- Improved direct access to the Data Clearinghouse through the WLCI Web site (<http://www.wlci.gov/>), 2009. Natalie Latysh and Sky Bristol
- Improved data and information records cataloged in WLCI Data Clearinghouse for display in WLCI website, 2012. Natalie Latysh
- Protocols for data harvesting using Web services. Natalie Latysh and Sky Bristol
- ScienceBase Data Clearinghouse user interface. Natalie Latysh and Sky Bristol
- Refined Data Clearinghouse search tools. Natalie Latysh and Sky Bristol
- New WLCI project-tracking interface and map-display feature, 2009. Updated 2010-2012. Natalie Latysh and Sky Bristol
- Additional development of the content-management application to facilitate the housing and maintenance of content specific to the WLCI Web site. Natalie Latysh and Sky Bristol

- Developed seamless access to WLCI Projects Database mapping application and WLCI Data Clearinghouse through the WLCI Web site. Natalie Latysh and Sky Bristol
- Agendas, videos, abstracts, and presentations posted to the WLCI Web site for the 2009 WLCI Science Workshop. Natalie Latysh and Sky Bristol
- Online registration and abstract submission collection instituted for the 2012 WLCI Science Workshop. Natalie Latysh
- Improved uploading capability allowing WLCI community members to add information resources directly to the WLCI Data Clearinghouse. Natalie Latysh and Sky Bristol
- Established myUSGS Confluence space, allowing CT members to archive, manage, and track project information. Natalie Latysh and Sky Bristol
- Comprehensive access to data resources, enabling WLCI data users to understand data and what may be accomplished with the data. Natalie Latysh

Integration and Coordination Activities

Databases and Sampling Designs/Protocols

- WLCI Coordination Team, Developed evaluation criteria to rank and prioritize WLCI conservation and habitat projects, and to support conservation planning. Pat Anderson

Maps and Imagery

- GIS-based maps to support the development of WLCI conservation goals, objectives, and strategies. Pat Anderson

USGS Series Reports (published, in press, or BAO approved)

- Bowen, Z.H., Aldridge, C.L., Anderson, P.J., Assal, T., Baer, L.A., Bristol, S., Carr, N.B., Chong, G.W., Diffendorfer, J.E., Fedy, B.C., Garman, S.L., Germaine, S., Grauch, R.I., Homer, C., Kauffman, M.J., Latysh, N., Manier, D., Melcher, C.P., Miller, K.A., Montag, J., Nutt, C.J., Potter, C., Sawyer, H., Smith, Sweat, M.J., and Wilson, A.B., 2009, U.S. Geological Survey Science for the Wyoming Landscape Conservation Initiative—2008 Annual Report: U.S. Geological Survey Open-File Report 2009–1201, 83 p., AT <http://pubs.usgs.gov/of/2009/1201/pdf/OF09-1201.pdf>. Zack Bowen
- Bowen, Z.H., Aldridge, C.L., Anderson, P.J., Assal, T., Biewick, L.R.H., Blecker, S.W., Bristol, S., Carr, N.B., Chalfoun, A.D., Chong, G.W., Diffendorfer, J.E., Fedy, B.C., Garman, S.L., Germaine, S., Grauch, R.I., Holloway, J., Homer, C., Kauffman, M.J., Keinath, D., Latysh, N., Manier, D., McDougal, R.R., Melcher, C.P., Miller, K.A., Montag, J., Nutt, C.J., Potter, C., Sawyer, H., Schell, S., Shafer, S., Smith, D.B., D.B., Stillings, L.L., Tuttle, M., and Wilson, A.B., 2009, U.S. Geological Survey Science for the Wyoming Landscape Conservation Initiative—2009 Annual Report: U.S. Geological Survey Open-File Report 2009–1231, 106 p., at <http://pubs.usgs.gov/of/2010/1231/>. Zack Bowen
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